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(54) **FOLDING VEHICLE**

KLAPPBARES FAHRZEUG

VÉHICULE PLIABLE

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(56) References cited:
EP-A1- 2 336 014
DE-A1-102013 003 484
JP-A- 2004 106 781
JP-A- 2012 224 186
JP-A- 2015 157 521
JP-U- 3 103 452
WO-A1-2014/207774
ES-U- 1 107 807
JP-A- 2004 525 019
JP-A- 2015 128 921
JP-B2- 3 189 751

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Description

FIELD

[0001] The present invention relates to a folding vehicle according to the preamble of claim 1 switchable among three modes including a folded mode, a seated driving mode, and a standing driving mode.

BACKGROUND

[0002] Conventionally, various folding vehicles have been proposed. For example, JP 4 117 660 B2 discloses a folding bicycle having the following configuration. Specifically, a handle strut and a wheel supporting frame are engaged with each other in a pivotable and fixable manner, via a folding mechanism that can pivot about an axis provided in a left and right direction. A coupling mechanism that can pivot about an axis provided in a front and rear direction is provided to the wheel supporting frame. A rear wheel can be fixed to and rotate about the wheel supporting frame as an axis.

[0003] This folding bicycle is switchable among three modes including a folded mode by being folded, a seated driving mode, and a standing driving mode. A generic folding vehicle according to the preamble of claim 1 is shown in EP 2 336 014 A1 and in ES 1 107 807 U.

Related Art Document

Patent Document

[0004]

Patent Document 1: JP 4 117 660 B2
Patent Document 2: EP 2 336 014 A1
Patent Document 3: ES 1 107 807 U

SUMMARY

Problems to be solved by the Invention

[0005] A saddle of the conventional folding bicycle is not obstructive in the folded mode and is used in the seated driving mode. Thus, the saddle remains to be attached in these two states. However, the saddle is obstructive and thus is removed in the standing driving mode.

[0006] The saddle removed while the folding bicycle is in the standing driving mode needs to be separately kept, and thus has a risk of being lost in some cases.

[0007] In the standing driving mode with the saddle removed, driving is hindered by a saddle supporting frame, for fixing the saddle, to be difficult.

[0008] The present invention is made to solve the conventional problem described above, and an object of the present invention is to provide a folding vehicle that can be in all of the folded mode, the seated driving mode, and the standing driving mode without removing a saddle member from a main frame mechanism, and can achieve the standing driving mode with driving not hindered by the saddle member.

Means for Solving the Problems

[0009] The problem is solved by a folding vehicle having the features of claim 1. Further advantageous developments of the present invention are set out in the dependent claims. According to the present invention, the folding vehicle comprises: a front frame, the front frame including: an upper end to which a handle is attached; and a lower end to which a front wheel is attached; a base frame by which the front frame is pivotally supported; a main frame mechanism, the main frame mechanism including: a first frame member pivotally supported with respect to the base frame; and a second frame member arranged in parallel with the first frame member, wherein the first frame member and the second frame member form a parallel link mechanism; a board attached to the main frame mechanism; a saddle member attached to at least one of an upper end portion of the first frame member and an upper end portion of the second frame member of the main frame mechanism; and a swing arm, the swing arm including: one end pivotally supported by the main frame mechanism; and another end by which a pair of rear wheels are rotatably supported, wherein the folding vehicle is switchable among: a first mode, in which the main frame mechanism is folded, achieved by pivoting the main frame mechanism toward the front frame; a second mode, in which driving while being seated on the saddle member is enabled, achieved by pivoting the main frame mechanism in the first mode; and a third mode, in which driving while standing on the board is enabled, achieved by pivoting the main frame mechanism in the second mode, and wherein the saddle member remains to be in a state of being attached to at least one of the upper end portion of the first frame member and the upper end portion of the second frame member in the first mode, the second mode, and the third mode.

[0010] According to the invention, the folding vehicle further comprises: a first lock mechanism that is provided between the base frame and the first frame member, the first lock mechanism including: a first striker member that is pivotally supported by the first frame member and provided with an engaged portion; and a first hook member that is provided to the base frame, pivotally supported and provided with a hook portion capable of engaging with the engaged portion of the first striker member; and a second lock mechanism that is provided between the second frame member and the swing arm, the second lock mechanism including: a rod member, the rod member including: one end pivotally supported by the second frame member; and another end provided with a stopper engaging portion; and a stopper member that is provided to the swing arm and to which the stopper engaging portion can be engaged, wherein the first lock mechanism

and the second lock mechanism cooperate to maintain the second mode.

[0011] Preferably, the folding vehicle further comprises a third lock mechanism, the third lock mechanism including: a second striker member that is pivotally supported at a portion near a rear end of the swing arm and provided with an engaged portion; and a second hook member that is provided to the saddle member, provided with a hook portion capable of engaging with the engaged portion of the second striker member and pivotally supported, wherein when the main frame mechanism is pivoted in the second mode, the first lock mechanism and the third lock mechanism cooperate to maintain the third mode.

[0012] Preferably, the folding vehicle is provided, wherein when the main frame mechanism is pivoted toward the front frame, the engaged portion of the second striker member in the third lock mechanism engages with the hook portion of the first hook member in the first lock mechanism to maintain the first mode.

[0013] Preferably, the folding vehicle further comprises a first release lever that is attached to the first hook member and with which engagement between the hook portion of the first hook member and the engaged portion of the first striker member is released.

[0014] Preferably, the folding vehicle further comprises a second release lever that is attached to the second hook member and with which engagement between the hook portion of the second hook member and the engaged portion of the second striker member is released.

Effects of the Invention

[0015] The folding vehicle according to the invention is configured to be switchable among: the first mode achieved with the main frame mechanism pivoted toward the front frame to be folded; the second mode, enabling driving while being seated on the saddle member, achieved by pivoting the main frame mechanism in the first mode; and the third mode, enabling driving while standing on the board, achieved by pivoting the main frame mechanism in the second mode, and the saddle member remains to be in the state of being attached to at least one of the upper end portion of the first frame member and the upper end portion of the second frame member in the first mode, the second mode, and the third mode. When the second mode transitions to the third mode, the saddle member is retracted to a portion of the swing arm on the side of the rear wheel as the main frame mechanism pivots. Thus, the saddle member can be certainly prevented from being lost without being obstructive in a standing driving mode, which corresponds to the third mode.

[0016] The folding vehicle according to the invention includes the first lock mechanism that is provided between the base frame and the first frame member and the second lock mechanism that is provided between the second frame member and the swing arm, and the first lock mechanism and the second lock mechanism cooperate to maintain the second mode, enabling driving while being seated on the saddle member. Thus, seated driving can be safely performed with the saddle member stably maintained.

[0017] The folding vehicle preferably includes the third lock mechanism that is provided between the saddle member and the swing arm, and when the main frame mechanism is pivoted in the second mode, the first lock mechanism and the third lock mechanism cooperate to maintain the third mode, enabling driving while standing. Thus, the board is stably maintained with the saddle member retracted to the portion of the swing arm on the side of the rear wheel, whereby standing driving can be safely performed on the board.

[0018] Preferably, in the folding vehicle, when the main frame mechanism is pivoted toward the front frame, the engaged portion of the second striker member in the third lock mechanism is engaged with the hook portion of the first hook member in the first lock mechanism for maintaining the first mode. Thus, the first mode can be stably maintained with the main frame mechanism and the front frame certainly locked with each other.

[0019] The folding vehicle preferably includes the first release lever with which engagement between the hook portion of the first hook member and the engaged portion of the first striker member is released, the first release lever being attached to the first hook member. Thus, the first lock mechanism can be unlocked by releasing the engagement between the hook portion of the first hook member and the engaged portion of the first striker member by operating the first release lever. Then, the main frame mechanism can be pivoted with respect to the front frame.

[0020] The folding vehicle preferably includes the second release lever with which engagement between the hook portion of the second hook member and the engaged portion of the second striker member is released, the second release lever being attached to the second hook member. Thus, the third lock mechanism can be unlocked by releasing the engagement between the hook portion of the second hook member and the engaged portion of the second striker member by operating the second release lever. Then, the main frame mechanism can be pivoted with respect to the front frame, together with the swing arm.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

[FIG. 1] FIG. 1 is a side view of a folding vehicle according to an embodiment of the present invention set in a seated driving mode.

[FIG. 2] FIG. 2 is a front perspective view of the folding vehicle set in the seated driving mode.

[FIG. 3] FIG. 3 is a side view of the folding vehicle set in a folded mode.

[FIG. 4] FIG. 4 is a front perspective view of the folding vehicle set in the folded mode.

[FIG. 5] FIG. 5 is a side view of the folding vehicle set in a standing driving mode.

[FIG. 6] FIG. 6 is a front perspective view of the folding vehicle set in the standing driving mode.

[FIG. 7]FIGs. 7 are diagrams schematically illustrating a first lock mechanism provided between a base frame and a main frame mechanism.

[FIG. 8] FIG. 8 is a diagram schematically illustrating a second lock mechanism provided between the main frame mechanism and swing arms.

[FIG. 9] FIGs. 9 are diagrams schematically illustrating a third lock mechanism provided between the main frame mechanism and a saddle member

[FIG. 10] FIG. 10 is a diagram schematically illustrating an operation transitioning from the folded mode to the seated driving mode or from the seated driving mode to the folded mode of the folding vehicle.

[FIG. 11] FIG. 11 is a diagram schematically illustrating a locked state of the first lock mechanism and the third lock mechanism in the standing driving mode of the folding vehicle.

DESCRIPTION OF EMBODIMENTS

[0022] A folding vehicle according to an embodiment of the present invention is described with reference to the drawings.

[0023] First of all, a basic configuration of the folding vehicle according to the embodiment is described with reference to FIG. 1 to FIG. 6.

[0024] The folding vehicle 1 includes a base frame 2 having the following form. Specifically, as illustrated in FIG. 2, FIG. 4, and FIG. 6, the base frame 2 includes a pair of side plates 2A and 2A, having a curved shape in side view, integrally coupled with each other via a flat plate 2B.

[0025] A front frame 3 is attached to a front portion of the base frame 2 pivotally in a substantially horizontal direction. A handle 4 is fixed to an upper end of the front frame 3. A cover 6 is attached to a front side of the front frame 3 via attachment members 5 and 5.

[0026] A wheel supporting frame 7 is fixed to a lower end of the front frame 3. A front wheel 8 is rotatably supported by the wheel supporting frame 7. The front wheel 8 incorporates an inline motor (not illustrated) that is driven by a battery 14 described later. The inline motor has a known configuration and thus will not be described in detail herein.

[0027] A main frame mechanism 9 is pivotally supported by both rear side portions of the base frame 2. The main frame mechanism 9 includes: first frame members 10 pivotally supported by outer surface upper portions of the side plates 2A, via a pivotally supporting member 2C; and second frame members 11 pivotally supported by outer surface lower portions of the side plates 2A, via a pivotally supporting member 2D, while being in parallel with the first frame members 10, at a position separated from the first frame members 10 by a predetermined distance. The first frame member 10 and the corresponding second frame member 11 are coupled to each other via a link member 12 in parallel with a line A passing through a pivot center of the first frame member 10 at the pivotally supporting member 2C and a pivot center of the second frame member 11 at the pivotally supporting member 2D. Thus, the first frame member 10 and the second frame member 11 form a parallel link mechanism.

[0028] A board 13 is disposed between the two first frame members 10 in parallel with each other (see FIG. 2). The battery 14, connected to the inline motor that drivingly rotates the front wheel 8, is disposed on a lower surface side of the board 13. A footrest 15 is attached to each of the side plates 2A of the base frame 2. A first lock mechanism L1, described later, is provided between the first frame members 10 of the main frame mechanism 9 and the base frame 2.

[0029] A saddle member 16 is attached to upper end portions of the first frame members 10 and the second frame members 11 in the main frame mechanism 9. More specifically, the saddle member 16 is pivotally attached to the upper end portions of the two first frame members 10 via pivotally supporting members 10A in a front portion of a supporting plate 17 provided on a lower surface of the saddle member 16. A third lock mechanism L3 is provided between a rear portion of the supporting plate 17 and the upper end portions of the second frame members 11. The saddle member 16 can pivot in a counterclockwise direction from a state illustrated in FIG. 1 and FIG. 3, based on locking and unlocking functions of the third lock mechanism L3, described later.

[0030] A pair of swing arms 18 each have one end pivotally supported by a substantially center portion of a corresponding one of the second frame members 11 in a longitudinal direction via pivotally supporting members 11A. The swing arms 18 each have the other end pivotally supporting a shaft 19 (see FIG. 2). A pair of rear wheels 20 and 20 (see FIG. 6) are rotatably supported on both ends of the shaft 19.

[0031] A second lock mechanism L2, described later, is provided between the second frame members 11 and the swing arms 18.

[0032] Next, the first lock mechanism L1 provided between the first frame members 10 of the main frame mechanism 9 and the base frame 2 is described with reference to FIG. 7.

[0033] In FIGs. 7(a) and 7(b), a striker 21, as a link member, is pivotally supported at the first frame member 10 of the main frame mechanism 9 via a supporting portion 21A. The striker 21 is a rod-shaped member having a substantially U shape in plain view. In FIG. 7(a), the striker 21 has as a lower portion serving as an engaged portion 21B engaged with a hook portion 23A of a hook member 23 described later.

[0034] A receiving member 22 is fixed to the flat plate

2B in a bottom portion of the base frame 2. A U-shaped groove 22A having a U shape in side view is formed on the receiving member 22. The hook member 23 including the hook portion 23A is pivotally supported at the receiving member 22 via a supporting member 23B. The hook member 23 is constantly urged in the counterclockwise direction by a spring incorporated therein.

[0035] A release lever 24 has one end coupled with the hook member 23. When the other end of the release lever 24 is pulled in a right direction in FIGs. 7(a) and 7(b), against urging force of the spring in an appropriate way, the hook portion 23A of the hook member 23 engaged with the engaged portion 21B of the striker 21 is pivoted in a clockwise direction. Thus, the engagement between the engaged portion 21B of the striker 21 and the hook portion 23A of the hook member 23 is released.

[0036] The main frame mechanism 9 is locked with the base frame 2, with the first lock mechanism L1 having the configuration described above, in the following manner. Specifically, as illustrated in FIG. 7(a), the engaged portion 21B of the striker 21 is set up in the U-shaped groove 22A of the receiving member 22, and the hook member 23 is pivoted in the counterclockwise direction by the urging force of the spring. Thus, the base frame 2 and the main frame mechanism 9 are locked as in a state illustrated in FIG. 7(a).

[0037] The locking between the base frame 2 and the main frame mechanism 9 can be released by pulling the release lever 24 in the right direction in FIG. 7(b) and releasing the engagement between the engaged portion 21B of the striker 21 and the hook portion 23A of the hook member 23.

[0038] Next, the second lock mechanism L2 provided between the second frame member 11 of the main frame mechanism 9 and the swing arm 18 is described with reference to FIG. 8.

[0039] In FIG. 8, a rod member 25 has one end pivotally supported at a position of the second frame member 11 above the pivotally supporting member 11A pivotally supporting the swing arm 18, via the pivotally supporting member 11B. A stopper engaging portion 25A having a rod shape is formed at the other end of the rod member 25.

[0040] A stopper member 18A is formed on the swing arm 18 pivotally supported by the second frame member 11 via the pivotally supporting member 11A. The stopper engaging portion 25A of the rod member 25 is engaged with the stopper member 18A from the above.

[0041] The second frame member 11 and the swing arm 18 can be locked, with the second lock mechanism L2 having the configuration described above, in the following manner. Specifically, the second frame member 11 and the swing arm 18 are pivoted with respect to each other, and the stopper engaging portion 25A of the rod member 25 is engaged with the stopper member 18A of the swing arm 18. The engaging can be released by pivoting the second frame member 11 and the swing arm 18 with respect to each other, and detaching the stopper engaging portion 25A of the rod member 25 from the stopper member 18A of the swing arm 18.

[0042] Next, the third lock mechanism L3 provided between the rear portion of the supporting plate 17 of the saddle member 16 and the upper end portion of the second frame member 11 is described with reference to FIG. 9. In FIG. 9, the supporting plate 17 is omitted to facilitate the understanding.

[0043] The striker 26 is a linear rod-shaped member bridging between supporting members 50 attached to the upper end portions of the two second frame members 11, and serves as an engaged portion 26A engaging with a hook portion 28A of a hook member 28 described later as illustrated in FIG. 9(a).

[0044] The receiving member 27, on which a U-shaped groove 27A having a U shape in side view is formed, is fixed on a bottom portion of the saddle member 16. The hook member 28 including the hook portion 28A is pivotally supported at the receiving member 27 via a supporting member 28B. The hook member 28 is constantly urged in the clockwise direction by a spring incorporated therein.

[0045] A release lever 29 has one end coupled with the hook member 28. When the other end of the release lever 29 is pulled in the right direction in FIGs. 9(a) and 9(b), against urging force of the spring in an appropriate way, the hook portion 28A of the hook member 28 engaged with the engaged portion 26A of the striker 26 is pivoted in the counterclockwise direction. Thus, the engagement between the engaged portion 26A of the striker 26 and the hook portion 28A of the hook member 28 is released.

[0046] The saddle member 16 and the upper end of the second frame member 11 are locked, with the third lock mechanism L3 having the configuration described above, in the following manner. Specifically, as illustrated in FIG. 9(a), the engaged portion 26A of the striker 26 is set up in the U-shaped groove 27A of the receiving member 27, and the hook member 28 is pivoted in the clockwise direction by the urging force of the spring. Thus, the saddle member 16 and the second frame member 11 are locked as in a state illustrated in FIG. 9(a).

[0047] The locking of the saddle member 16 and the second frame member 11 can be released by pulling the release lever 29 in the right direction in FIGs. 9(a) and 9(b) and releasing the engagement between the engaged portion 26A of the striker 26 and the hook portion 28A of the hook member 28.

[0048] As illustrated in FIG. 10, a striker 30, having a configuration similar to that of the striker 21, is pivotally supported at a rear end portion of the swing arm 18 (around a right end portion in FIG. 10) via a pivotally supporting portion 31. The striker 30 is a rod-shaped member having a substantially U shape in plain view, and has an engaged portion 32 engaged with the hook portion 23A of the hook member 23 in the first lock mechanism L1, on the side opposite to the pivotally supporting portion 31, as described below.

[0049] Next, a relationship between the lock mechanisms described above and the folding vehicle 1 in the folded mode, the seated driving mode, and the standing driving mode is described.

[0050] To begin with, the folding vehicle 1 is assumed to be in the seated driving mode as illustrated in FIGs. 1 and 2.

[0051] When the folding vehicle 1 is in the seated driving mode, the first lock mechanism L1 and the second lock mechanism L2 are each in the locked state.

[0052] More specifically, as illustrated in FIG. 7(a), the engaged portion 21B of the striker 21 in the first lock mechanism L1 is set up in the U-shaped groove 22A of the receiving member 22, and the hook portion 23A of the hook member 23 is engaged with the engaged portion 21B of the striker 21.

[0053] As illustrated in FIG. 8, the stopper engaging portion 25A of the rod member 25 of the second lock mechanism L2 is engaged with the stopper member 18A of the swing arm 18.

[0054] As a result, the seated driving mode is maintained with the first lock mechanism L1 and the second lock mechanism L2 cooperating to lock the base frame 2 and the main frame mechanism 9 to achieve the state illustrated in FIG. 1, FIG. 2, FIG. 7(a), and FIG. 8. Thus, a driver can enjoy safe driving while being seated on the saddle member 16.

[0055] The seated driving mode transitions to the folded mode illustrated in FIGs. 3 and 4 in the following manner. First of all, the release lever 24 is pulled in the right direction in FIG. 7(b) to release the locking of the base frame 2 and the main frame mechanism 9. Thus, the engagement between the engaged portion 21B of the striker 21 and the hook portion 23A of the hook member 23 is released, whereby the locking by the first lock mechanism L1 is released. The second frame member 11 and the swing arm 18 are pivoted with respect to each other, and thus the stopper engaging portion 25A of the rod member 25 is detached from the stopper member 18A of the swing arm 18, whereby the locking by the second lock mechanism L2 is released.

[0056] Then, the main frame mechanism 9, which has become pivotable with respect to the base frame 2 as a result of the above process, is pivoted toward the front frame 3. In this process, the second lock mechanism L2 is unlocked, and thus the swing arm 18 approaches the front frame 3 as the main frame mechanism 9 pivots. Thus, the main frame mechanism 9 and the swing arm 18 are in the folded mode illustrated in FIGs. 3 and 4.

[0057] In the folded mode, the engaged portion 32 of the striker 30 pivotally supported at the swing arm 18 is set up in the U-shaped groove 22A of the receiving member 22 in the first lock mechanism L1, and the hook portion 23A of the hook member 23 is engaged.

[0058] Thus, in the folded mode, the main frame mechanism 9 can be prevented from pivoting from the front frame 3, whereby the folded mode can be stably maintained.

[0059] When the seated driving mode illustrated in FIGs. 1 and 2 transitions to the standing driving mode illustrated in FIGs. 5 and 6, the following operation is performed. Specifically, as in the case described above, the release lever 24 is pulled in the right direction in FIG. 7(b) to release the locking between the base frame 2 and the main frame mechanism 9, and the engagement between the engaged portion 21B of the striker 21 and the hook portion 23A of the hook member 23 is released, whereby the first lock mechanism L1 is unlocked. The second frame member 11 and the swing arm 18 are pivoted with respect to each other to detach the stopper engaging portion 25A of the rod member 25 from the stopper member 18A of the swing arm 18, whereby the second lock mechanism L2 is unlocked. Furthermore, the release lever 29 is pulled in the right direction in FIGs. 9(a) and 9(b) to release the engagement between the engaged portion 26A of the striker 26 and the hook portion 28A of the hook member 28, whereby the third lock mechanism L3 is further unlocked.

[0060] The main frame mechanism 9, which has become pivotable with respect to the base frame 2 as a result of the above process, is pivoted in a direction for moving away from the front frame 3 as illustrated in FIG. 10. In this process, the second lock mechanism L2 is unlocked, and thus the swing arm 18 moves away from the front frame 3 as the main frame mechanism 9 pivots. Thus, the main frame mechanism 9 and the swing arm 18 are in the standing driving mode as illustrated in FIG. 11.

[0061] In the standing driving mode, the engaged portion 21B of the striker 21 in the first lock mechanism L1 is set up in the U-shaped groove 22A of the receiving member 22, and the hook portion 23A of the hook member 23 is engaged with the engaged portion 21B of the striker 21. The engaged portion 32 of the striker 30 pivotally supported at the swing arm 18 is set up in the U-shaped groove 27A of the receiving member 27 in the third lock mechanism L3, and the hook member 28 is pivoted in the counterclockwise direction by the urging force of the spring, whereby the third lock mechanism L3 is locked.

[0062] Thus, in the standing driving mode, the base frame 2 and the main frame mechanism 9 as well as the main frame mechanism 9 and the swing arm 18 can be locked with each other in a state illustrated in FIG. 11. Thus, the driver on the board 13 can enjoy safe standing driving.

[0063] As described above, the folding vehicle 1 according to the present embodiment is configured to be switchable among: the folded mode achieved with the main frame mechanism 9 pivoted toward the front frame 3 to be folded; the seated driving mode, enabling driving while being seated on the saddle member 16, achieved by pivoting the main frame mechanism 9 from the front frame 3 in the folded mode; and the standing driving mode, enabling driving while standing, achieved by pivoting the main frame mechanism 9 in the seated driving

mode. The saddle member 16, attached to the upper end portions of the first frame member 10 and the second frame member 11 in the main frame mechanism 9, remains to be in the state of being attached to the upper end portions of the first frame member 10 and the second frame member 11 in the folded mode and in the seated driving mode, with the locking function of the third lock mechanism L3. When the seated driving mode transitions to the standing driving mode, the third lock mechanism L3 is unlocked, and thus the saddle member 16 is retracted to a portion of the swing arm 18 on the side of the rear wheel 20 as the main frame mechanism 9 pivots. Thus, the saddle member 16 can be certainly prevented from being lost without being obstructive in the standing driving mode.

[0064] The first lock mechanism L1 is provided between the base frame 2 and the first frame member 10 and the second lock mechanism L2 is provided between the second frame member 11 and the swing arm 18. The first lock mechanism L1 and the second lock mechanism L2 cooperate to maintain the seated driving mode enabling driving while being seated on the saddle member 16. Thus, seated driving can be safely performed with the saddle member 16 stably maintained.

[0065] In the standing driving mode, the base frame 2 and the first frame member 10 are locked with each other with the first lock mechanism L1, and the striker 30 pivotally supported by the swing arm 18 is locked with the third lock mechanism L3. Thus, the board 13 is stably maintained with the saddle member 16 in the standing driving mode retracted to a portion of the swing arm 18 on the side of the rear wheel 20, whereby standing driving can be safely performed on the board 13.

[0066] When the main frame mechanism 9 is pivoted toward the front frame 3, the engaged portion 32 of the striker 30 pivotally supported at the swing arm 18 is engaged with the hook portion 23A of the first hook member 23 in the first lock mechanism L1 for maintaining the folded mode. Thus, the folded mode can be stably maintained with the main frame mechanism 9 and the front frame 3 certainly locked with each other.

[0067] The release lever 24 is attached to the hook member 23 in the first lock mechanism L1. With the release lever 24, the engagement between the hook portion 23A of the hook member 23 and the engaged portion 21B of the striker 21 is released. Thus, the first lock mechanism L1 can be unlocked by releasing the engagement between the hook portion 23A of the hook member 23 and the engaged portion 21B of the striker 21 by operating the release lever 24. Then, the main frame mechanism 9 can be pivoted with respect to the front frame 3 from the folded mode to the seated driving mode.

[0068] The locking of the striker 26, attached to the second frame member 11, by the third lock mechanism L3 can be released as follows. Specifically, the third lock mechanism L3 can be unlocked by releasing the engagement between the hook portion 28A of the hook member 28 and the engaged portion 26A of the striker 26 by operating the release lever 29 coupled to the hook member 28. Then, the main frame mechanism 9 can be pivoted with respect to the front frame 3, together with the swing arm 18.

[0069] The present embodiment does not limit the present invention which is defined by the appended claims. The brake levers provided to both sides of the handle 4, wiring between the brake levers and brakes, electric wiring for a power supply for driving a motor, and the like which are omitted in the present embodiment may be appropriately set in the actual implementation.

[0070] In the present embodiment, the third lock mechanism L3 needs to be unlocked when the folding vehicle 1 is set to the standing driving mode. As described above, the standing driving mode may be achieved with the state of locking the saddle member 16 to the first frame member 10 and the second frame member 11 maintained and without unlocking the third lock mechanism L3, by appropriately setting the attachment positions of the first frame member 10 and the second frame member 11, forming the parallel link mechanism, on the base frame 2, and the attachment condition of the saddle member 16 to the first frame member 10 and the second frame member 11.

EXPLANATION OF REFERENCE NUMERALS

[0071]

1	folding vehicle
2	base frame
3	front frame
4	handle
8	front wheel
9	main frame mechanism
10	first frame member
11	second frame member
13	board
16	saddle member
18	swing arm
18A	stopper member
20	rear wheel
21	striker
23	hook member
23A	hook portion
24	release lever
25	rod member
26	striker
26A	engaged portion
28	hook member
28A	hook portion
29	release lever
30	striker
32	engaged portion
L1	first lock mechanism
L2	second lock mechanism
L3	third lock mechanism

Claims

1. A folding vehicle (1) comprising:

a front frame (3), the front frame (3) including:

an upper end to which a handle (4) is attached; and
a lower end to which a front wheel (8) is attached;

a base frame (2) by which the front frame (3) is pivotally supported;
a main frame mechanism (9), the main frame mechanism (9) including:

a first frame member (10) pivotally supported with respect to the base frame (2); and
a second frame member (11) arranged in parallel with the first frame member (10),

wherein the first frame member (10) and the second frame member (11) form a parallel link mechanism;
a board (13) attached to the main frame mechanism (9);
a saddle member (16) attached to at least one of an upper end portion of the first frame member (10) and an upper end portion of the second frame member (11) of the main frame mechanism (9);
a swing arm (18), the swing arm (18) including:

one end pivotally supported by the main frame mechanism (9); and
another end by which a pair of rear wheels (20) are rotatably supported,

wherein the folding vehicle (1) is switchable among:

a first mode, in which the main frame mechanism (9) is folded, achieved by pivoting the main frame mechanism (9) toward the front frame (3);
a second mode, in which driving while being seated on the saddle member (16) is enabled, achieved by pivoting the main frame mechanism (9) when the folding vehicle is in the first mode; and
a third mode, in which driving while standing on the board (13) is enabled, achieved by pivoting the main frame mechanism (9) when the folding vehicle is in the second mode, and

wherein the saddle member (16) remains to be in a state of being attached to the at least one of the upper end portion of the first frame member (10) and the upper end portion of the second frame member (11) in the first mode, the second mode, and the third mode, **characterized by**
a first lock mechanism (L1) that is provided between the base frame (2) and the first frame member (10), the first lock mechanism (L1) including:

a first striker member (21) that is pivotally supported by the first frame member (10) and provided with an engaged portion (21B); and
a first hook member (23) that is provided to the base frame (2), pivotally supported and provided with a hook portion (23A) capable of engaging with the engaged portion (21B) of the first striker member (21); and

a second lock mechanism (L2) that is provided between the second frame member (11) and the swing arm (18), the second lock mechanism (L2) including:

a rod member (25), the rod member (25) including:

one end pivotally supported by the second frame member (11); and
another end provided with a stopper engaging portion (25A); and

a stopper member (18A) that is provided to the swing arm (18) and to which the stopper engaging portion (25A) can be engaged,

wherein the first lock mechanism (L1) and the second lock mechanism (L2) cooperate to maintain the second mode.

2. The folding vehicle (1) according to claim 1 further comprising a third lock mechanism (L3), the third lock mechanism (L3) including:

a second striker member (30) that is pivotally supported at a portion near a rear end of the swing arm (18) and provided with an engaged portion (32); and
a second hook member (28) that is provided to the saddle member (16), provided with a hook portion (28A) capable of engaging with the engaged portion (32) of the second striker member (30) and pivotally supported, wherein when the main frame mechanism (9) is pivoted when the folding vehicle is in the second mode, the first lock mechanism (L1) and the third lock mechanism (L3) cooperate to maintain the third mode.

3. The folding vehicle (1) according to claim 2, wherein when the main frame mechanism (9) is pivoted toward the front frame (3), the engaged portion (32) of the second striker member (30) in the third lock mechanism (L3) engages with the hook portion (23A) of the first hook member (23) in the first lock mechanism (L1) to maintain the first mode.

4. The folding vehicle (1) according to claim 1 further comprising
a first release lever (24) that is attached to the first hook member (23) and with which engagement between the hook portion (23A) of the first hook member (23) and the engaged portion (21B) of the first striker member (21) is released.

5. The folding vehicle (1) according to claim 2 further comprising
a second release lever (29) that is attached to the second hook member (28) and with which engagement between the hook portion (28A) of the second hook member (28) and the engaged portion of the second striker member is released.

Patentansprüche

1. Klappfahrzeug (1), mit:

einem Frontrahmen (3), wobei der Frontrahmen (3) Folgendes umfasst:

ein oberes Ende, an dem ein Griff (4) befestigt ist; und
ein unteres Ende, an dem ein Frontrad (8) befestigt ist;

einem Basisrahmen (2), durch den der Frontrahmen (3) schwenkbar gestützt ist;
einem Hauptrahmenmechanismus (9), wobei der Hauptrahmenmechanismus (9) Folgendes umfasst:

ein erstes Rahmenelement (10), das bezüglich des Basisrahmens (2) schwenkbar gestützt ist; und
ein zweites Rahmenelement (11), das parallel zu dem ersten Rahmenelement (10) angeordnet ist,

wobei das erste Rahmenelement (10) und das zweite Rahmenelement (11) einen parallelen Bindegliedmechanismus ausbilden;
einer Platte (13), die an dem Hauptrahmenmechanismus (9) befestigt ist;
einem Sattelelement (16), das mindestens an einem von einem oberen Endabschnitt des ersten Rahmenelements (10) und einem oberen Endabschnitt des zweiten Rahmenelements (11) des Hauptrahmenmechanismus (9) befestigt ist;
einem Schwingarm (18), wobei der Schwingarm (18) Folgendes umfasst:

ein Ende, das durch den Hauptrahmenmechanismus (9) schwenkbar gestützt ist; und
ein anderes Ende, durch das ein Paar von Heckrädern (20) drehbar gestützt ist,

wobei das Klappfahrzeug (1) zwischen Folgendem umstellbar ist:

einem ersten Modus, in dem der Hauptrahmenmechanismus (9) geklappt ist, der erreicht wird, indem der Hauptrahmenmechanismus (9) in Richtung des Frontrahmens (3) geschwenkt wird;
einem zweiten Modus, in dem es möglich ist zu fahren, während man auf dem Sattelelement (16) sitzt, der erreicht wird, indem der Hauptrahmenmechanismus (9) geschwenkt wird, wenn das Klappfahrzeug in dem ersten Modus ist; und
einem dritten Modus, in dem es möglich ist zu fahren, während man auf der Platte (13) steht, der erreicht wird, indem der Hauptrahmenmechanismus (9) geschwenkt wird, wenn das Klappfahrzeug in dem zweiten Modus ist, und

wobei das Sattelelement (16) in einem Zustand verbleibt, in dem es an mindestens einem von dem oberen Endabschnitt des ersten Rahmenelements (10) und dem oberen Endabschnitt des zweiten Rahmenelements (11) in dem ersten Modus, dem zweiten Modus und dem dritten Modus befestigt ist, **gekennzeichnet durch**
einen ersten Verriegelungsmechanismus (L1), der zwischen dem Basisrahmen (2) und dem ersten Rahmenelement (10) vorgesehen ist, wobei der erste Verriegelungsmechanismus (L1) Folgendes umfasst:

ein erstes Verriegelungsstück (21), das durch das erste Rahmenelement (10) schwenkbar gestützt ist und mit einem eingreifenden Abschnitt (21B) versehen ist; und
ein erstes Hakenelement (23), das an dem Basisrahmen (2) vorgesehen ist, schwenkbar gestützt ist und mit einem Hakenabschnitt (23A) versehen ist, der imstande ist, mit dem eingreifenden Abschnitt (21B) des ersten Verriegelungsstücks (21) in Eingriff zu gelangen; und

einen zweiten Verriegelungsmechanismus (L2), der zwischen dem zweiten Rahmenelement (11) und dem Schwingarm (18) vorgesehen ist, wobei der zweite Verriegelungsmechanismus (L2) Folgendes umfasst:

ein Stabelement (25), wobei das Stabelement (25) Folgendes umfasst:

ein Ende, das durch das zweite Rahmenelement (11) schwenkbar gestützt ist; und
ein anderes Ende, das mit einem Stoppereingriffsabschnitt (25A) versehen ist; und

ein Stopperelement (18A), das an dem Schwingarm (18) vorgesehen ist und mit dem der Stoppereingriffsabschnitt (25A) in Eingriff gebracht werden kann,

wobei der erste Verriegelungsmechanismus (L1) und der zweite Verriegelungsmechanismus (L2) zusammenwirken, um den zweiten Modus aufrechtzuerhalten.

2. Klappfahrzeug (1) nach Anspruch 1, ferner mit einem dritten Verriegelungsmechanismus (L3) wobei der dritte Verriegelungsmechanismus (L3) Folgendes umfasst:

ein zweites Verriegelungsstück (30), das an einem Abschnitt in der Nähe eines Heckendes des Schwingarms (18) schwenkbar gestützt ist und mit einem eingreifenden Abschnitt (32) versehen ist; und
ein zweites Hakenelement (28), das an dem Sattelelement (16) vorgesehen ist, mit einem Hakenabschnitt (28A) versehen ist, der imstande ist, mit dem eingreifenden Abschnitt (32) des zweiten Verriegelungsstücks (30) in Eingriff zu gelangen, und schwenkbar gestützt ist,

wobei, wenn der Hauptrahmenmechanismus (9) geschwenkt wird, wenn das Klappfahrzeug in dem zweiten Modus ist, der erste Verriegelungsmechanismus (L1) und der dritte Verriegelungsmechanismus (L3) zusammenwirken, um den dritten Modus aufrechtzuerhalten.

3. Klappfahrzeug (1) nach Anspruch 2, wobei, wenn der Hauptrahmenmechanismus (9) in Richtung des Frontrahmens (3) geschwenkt wird, der eingreifende Abschnitt (32) des zweiten Verriegelungsstücks (30) in dem dritten Verriegelungsmechanismus (L3) mit dem Hakenabschnitt (23A) des ersten Hakenelements (23) in dem ersten Verriegelungsmechanismus (L1) in Eingriff gelangt, um den ersten Modus aufrecht zu erhalten.

4. Klappfahrzeug (1) nach Anspruch 1, ferner mit einem ersten Freigabehebel (24), der an dem ersten Hakenelement (23) befestigt ist, und mit dem ein Eingriff zwischen dem Hakenabschnitt (23A) des ersten Hakenelements (23) und dem eingreifenden Abschnitt (21B) des ersten Verriegelungsstücks (21) freigegeben wird.

5. Klappfahrzeug (1) nach Anspruch 2, ferner mit einem zweiten Freigabehebel (29), der an dem zweiten Hakenelement (28) befestigt ist, und mit dem ein Eingriff zwischen dem Hakenabschnitt (28A) des zweiten Hakenelements (28) und dem eingreifenden Abschnitt des zweiten Verriegelungsstücks freigegeben wird.

Revendications

1. Véhicule pliable (1) comprenant :
un cadre avant (3), le cadre avant (3) incluant :

une extrémité supérieure à laquelle un guidon (4) est attaché ; et
une extrémité inférieure à laquelle une roue avant (8) est attachée ;
un cadre de base (2) par lequel le cadre avant (3) est supporté de manière pivotante ;
un mécanisme de cadre principal (9), le mécanisme de cadre principal (9) incluant :

un premier élément de cadre (10) supporté de manière pivotante par rapport au cadre de base (2) ; et
un second élément de cadre (11) agencé parallèlement au premier élément de cadre (10),
dans lequel le premier élément de cadre (10) et le second élément de cadre (11) forment un mécanisme de liaison parallèle ;
une planche (13) attachée au mécanisme de cadre principal (9) ;
un élément selle (16) attaché à au moins une parmi une partie d'extrémité supérieure du premier élément de cadre (10) et une partie d'extrémité supérieure du second élément de cadre (11) du mécanisme de cadre principal (9) ;
un bras oscillant (18), le bras oscillant (18) incluant :

une extrémité supportée de manière pivotante par le mécanisme de cadre principal (9) ; et
une autre extrémité par laquelle une paire de roues arrière (20) sont suppor-

tées de manière rotative,
dans lequel le véhicule pliable (1) peut alterner entre :

un premier mode, dans lequel le mécanisme de cadre principal (9) est plié, obtenu en faisant pivoter le mécanisme de cadre principal (9) vers le cadre avant (3) ;
un deuxième mode, dans lequel la conduite tout en étant assis sur l'élément selle (16) est permise, obtenu en faisant pivoter le mécanisme de cadre principal (9) lorsque le véhicule pliable est dans le premier mode ; et
un troisième mode, dans lequel la conduite tout en se tenant debout sur la planche (13) est permise, obtenu en faisant pivoter le mécanisme de cadre principal (9) lorsque le véhicule pliable est dans le deuxième mode, et
dans lequel l'élément selle (16) reste pour être dans un état où il est attaché à l'au moins une parmi la partie d'extrémité supérieure du premier élément de cadre (10) et la partie d'extrémité supérieure du second élément de cadre (11) dans le premier mode, le deuxième mode, et le troisième mode, **caractérisé par** un premier mécanisme de verrouillage (L1) qui est prévu entre le cadre de base (2) et le premier élément de cadre (10), le premier mécanisme de verrouillage (L1) incluant :

un premier élément gâche (21) qui est supporté de manière pivotante par le premier élément de cadre (10) et pourvu d'une partie mise en prise (21B) ; et
un premier élément à crochet (23) qui est prévu sur le cadre de base (2), supporté de manière pivotante et pourvu d'une partie crochet (23A) capable de venir en prise avec la partie mise en prise (21B) du premier élément gâche (21) ; et
un deuxième mécanisme de verrouillage (L2) qui est prévu entre le second élément de cadre (11) et le bras oscillant (18), le deuxième mécanisme de verrouillage (L2) incluant :
un élément tige (25), l'élément tige (25) incluant :

une extrémité supportée de manière pivotante par le second élément de cadre (11) ; et
une autre extrémité pourvue d'une partie de mise en prise de butoir (25A) ; et
un élément butoir (18A) qui est prévu sur le bras oscillant (18) et avec lequel la partie de mise en prise de butoir (25A) peut être mise en prise,
dans lequel le premier mécanisme de verrouillage (L1) et le deuxième mécanisme de verrouillage (L2) coopèrent pour maintenir le deuxième mode.

2. Véhicule pliable (1) selon la revendication 1 comprenant en outre
un troisième mécanisme de verrouillage (L3), le troisième mécanisme de verrouillage (L3) incluant :

un second élément gâche (30) qui est supporté de manière pivotante au niveau d'une partie près d'une extrémité arrière du bras oscillant (18) et pourvu d'une partie mise en prise (32) ; et
un second élément à crochet (28) qui est prévu sur l'élément selle (16), pourvu d'une partie crochet (28A) capable de venir en prise avec la partie mise en prise (32) du second élément gâche (30) et supporté de manière pivotante,
dans lequel lorsque le mécanisme de cadre principal (9) est pivoté lorsque le véhicule pliable est dans le deuxième mode, le premier mécanisme de verrouillage (L1) et le troisième mécanisme de verrouillage (L3) coopèrent pour maintenir le troisième mode.

3. Véhicule pliable (1) selon la revendication 2,
dans lequel lorsque le mécanisme de cadre principal (9) est pivoté vers le cadre avant (3), la partie mise en prise (32) du second élément gâche (30) dans le troisième mécanisme de verrouillage (L3) vient en prise avec la partie crochet (23A) du premier élément à crochet (23) dans le premier mécanisme de verrouillage (L1) pour maintenir le premier mode.

4. Véhicule pliable (1) selon la revendication 1 compre-

nant en outre
un premier levier de libération (24) qui est attaché au premier élément à crochet (23) et avec lequel une mise en prise entre la partie crochet (23A) du premier élément à crochet (23) et la partie mise en prise (21B) du premier élément gâche (21) est libérée.

5. Véhicule pliable (1) selon la revendication 2 comprenant en outre
un second levier de libération (29) qui est attaché au second élément à crochet (28) et avec lequel une mise en prise entre la partie crochet (28A) du second élément à crochet (28) et la partie mise en prise du second élément gâche est libérée.

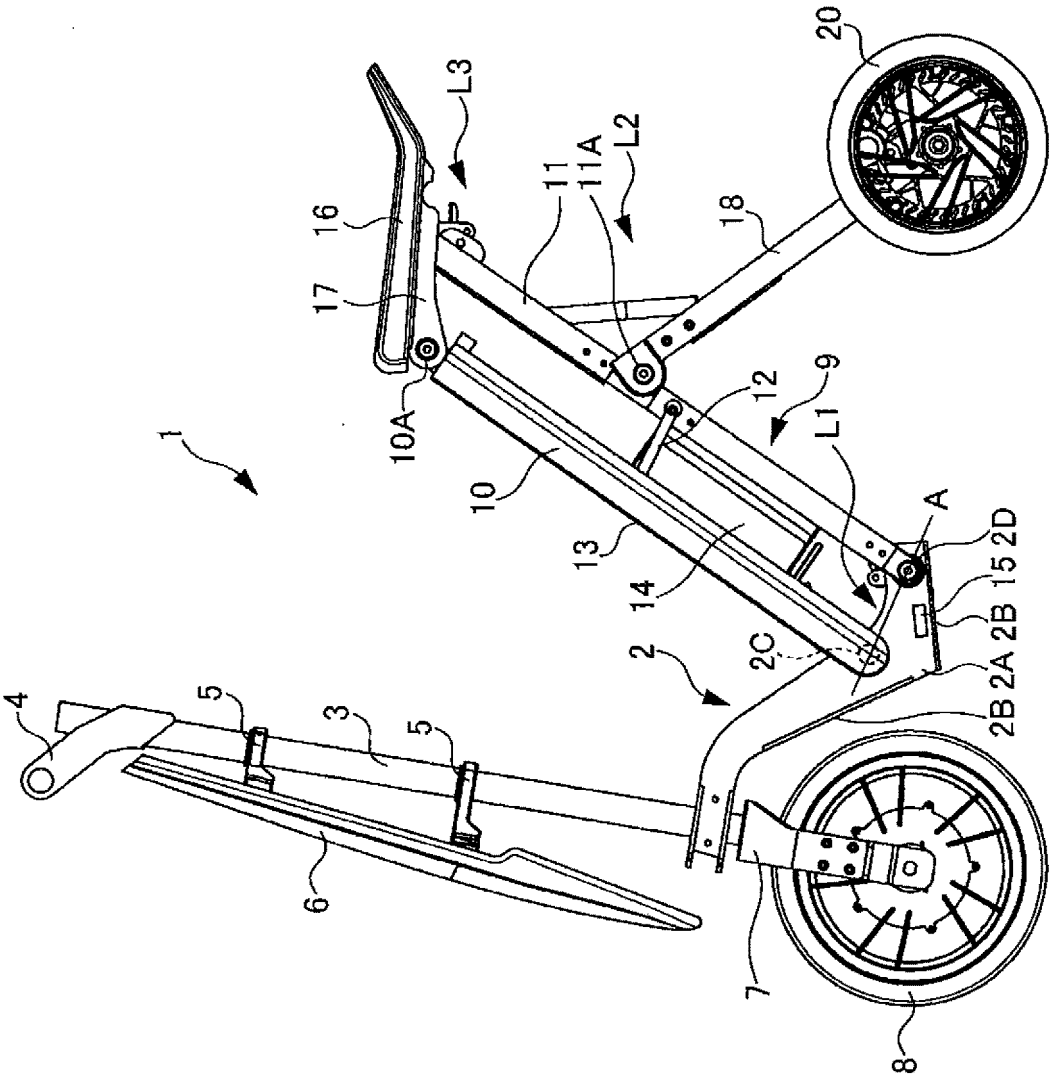

1
2
2A
2B
2C
2D
3
4
5
6
7
8
9
10
10A
11
11A
12
13
14
15
16
17
18
20
A
L1
L2
L3

FIG. 1

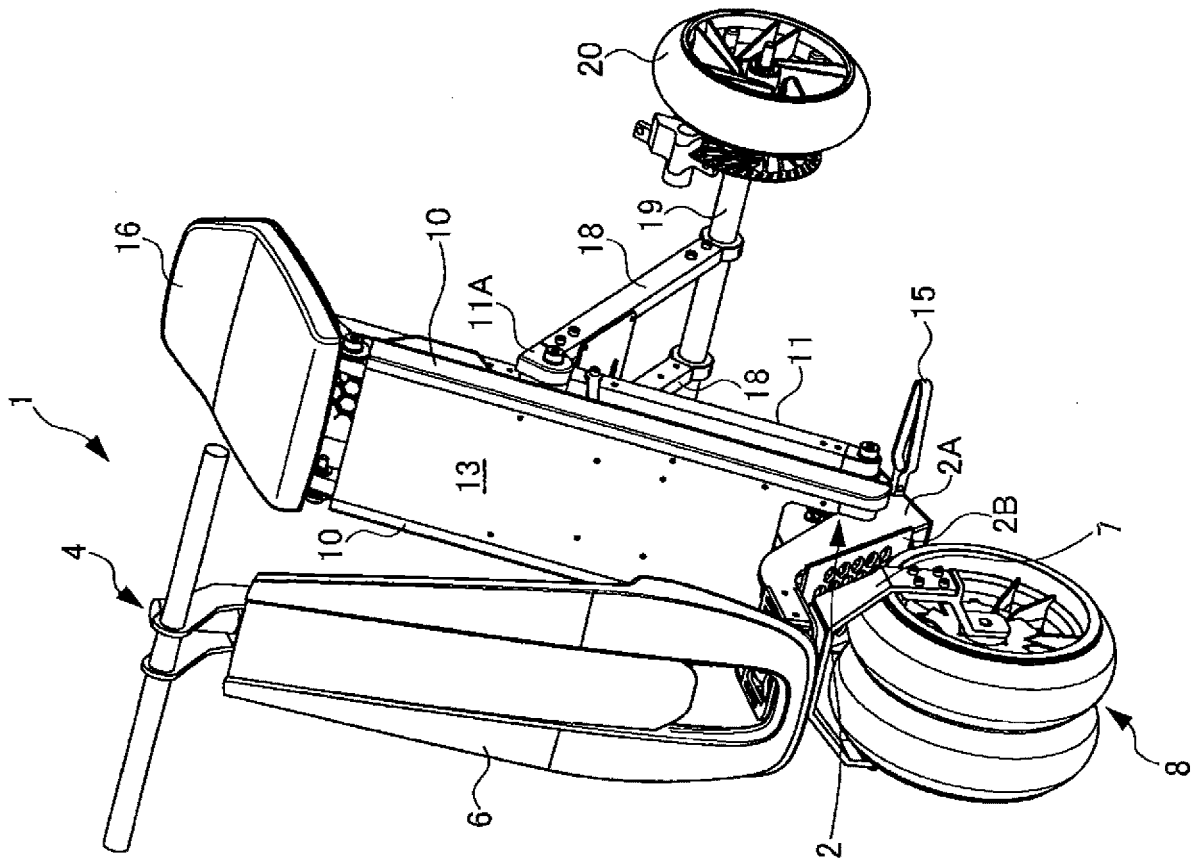


FIG. 2

FIG. 3

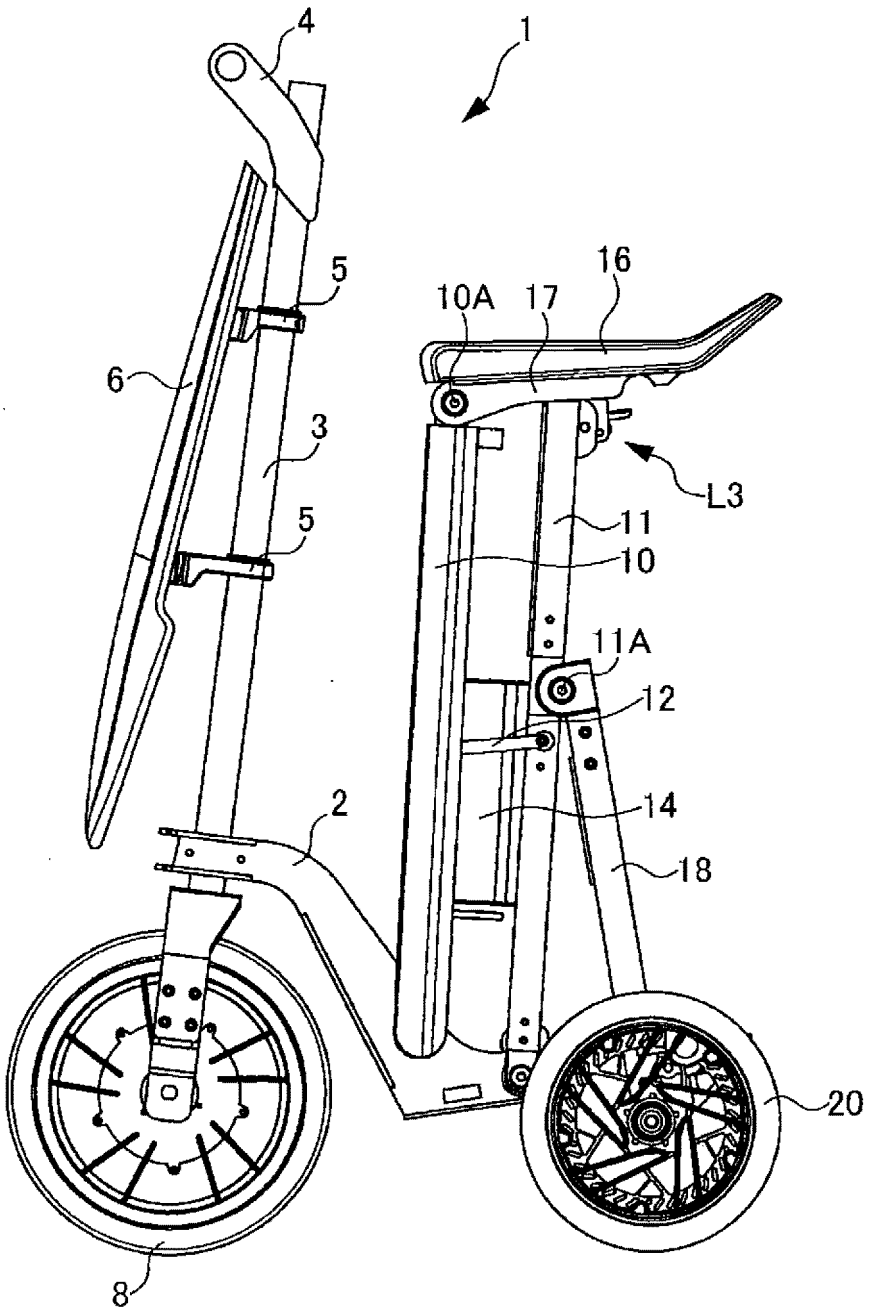
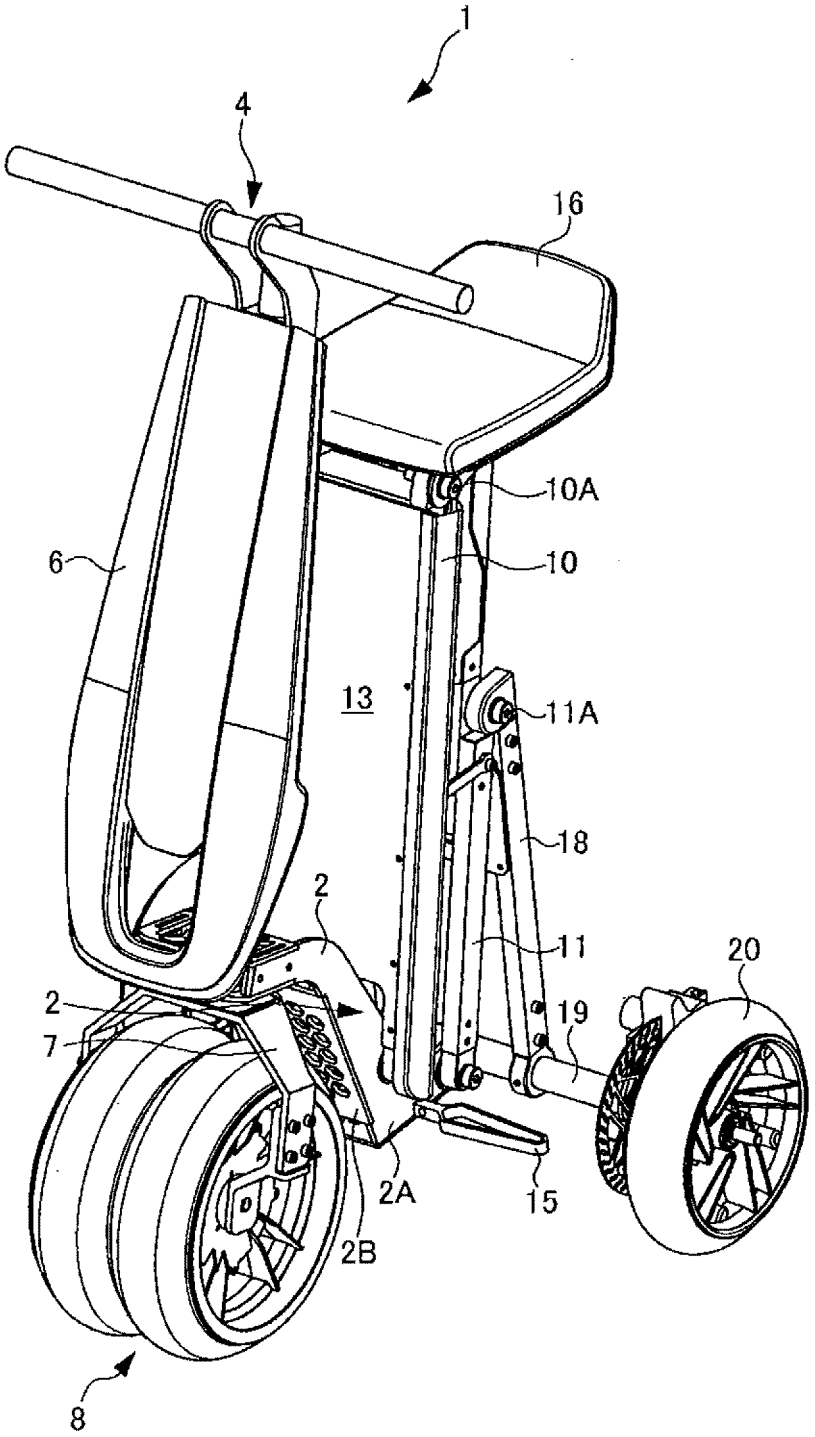


FIG. 4



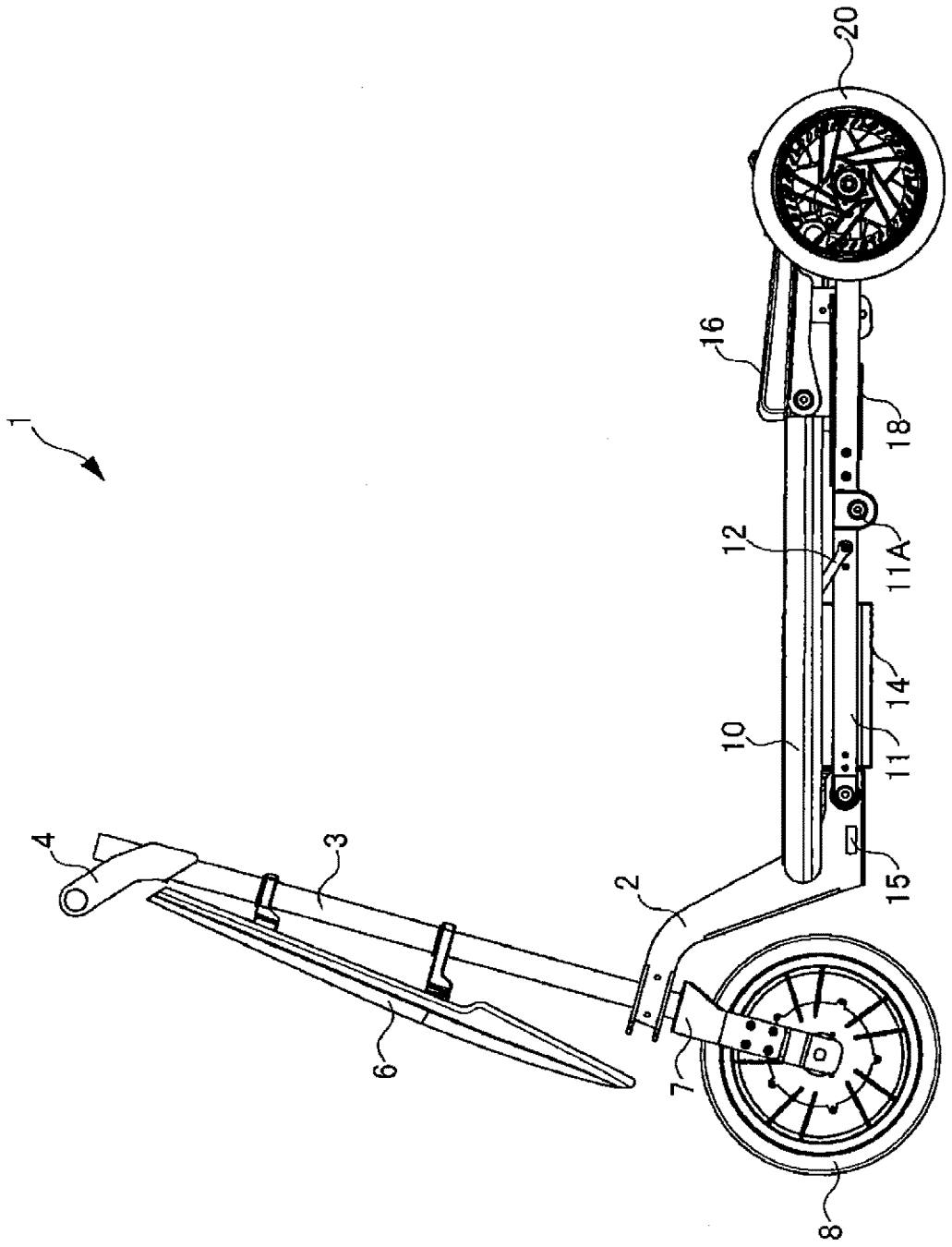


FIG. 5

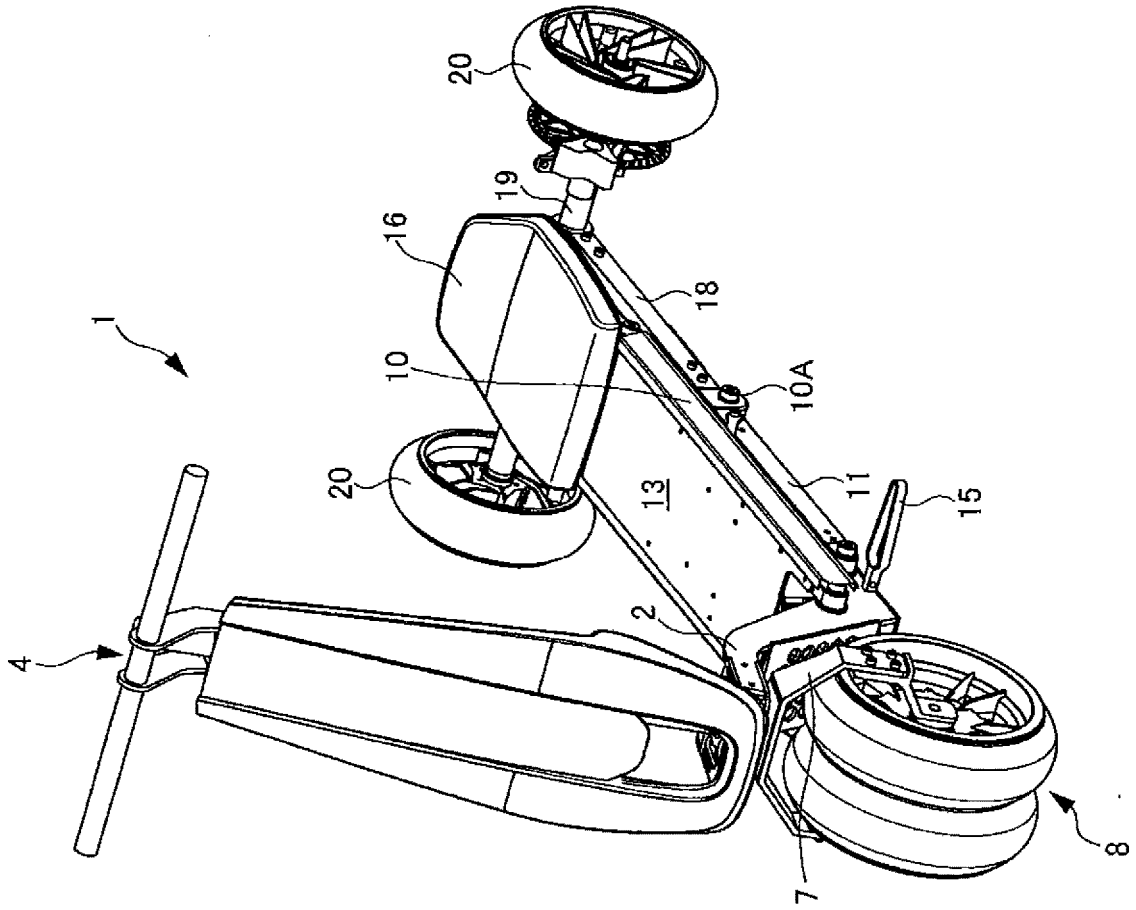


FIG. 6

FIG. 7(a)

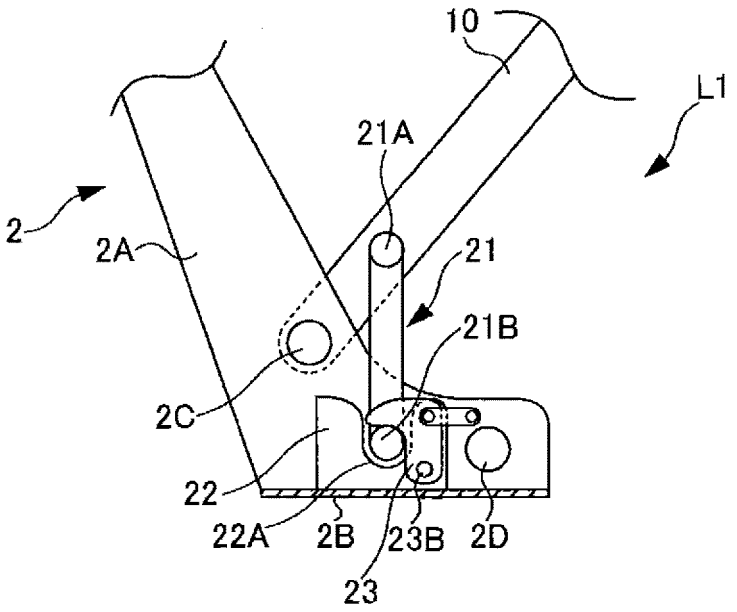


FIG. 7(b)

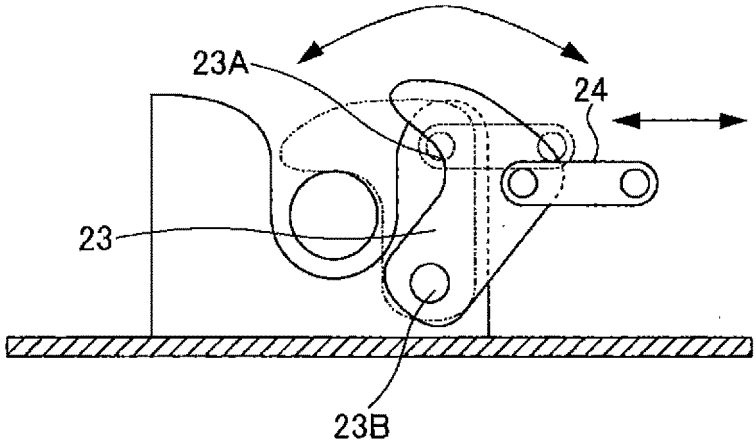


FIG. 8

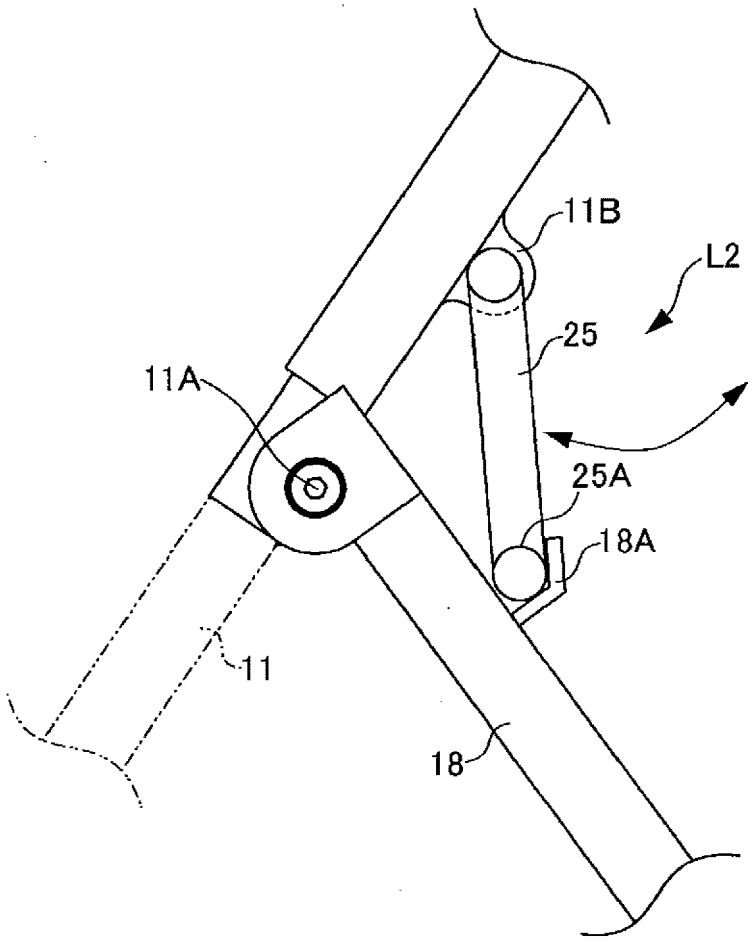


FIG. 9(a)

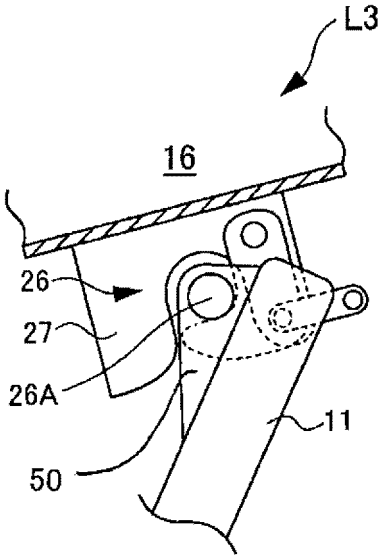


FIG. 9(b)

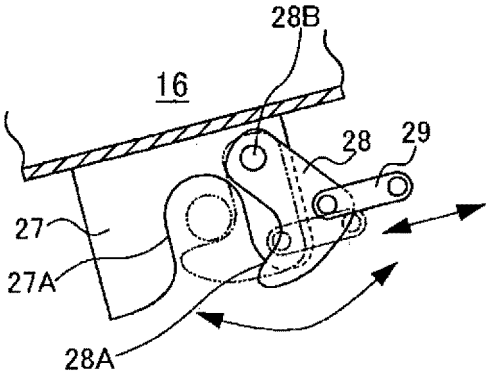


FIG. 10

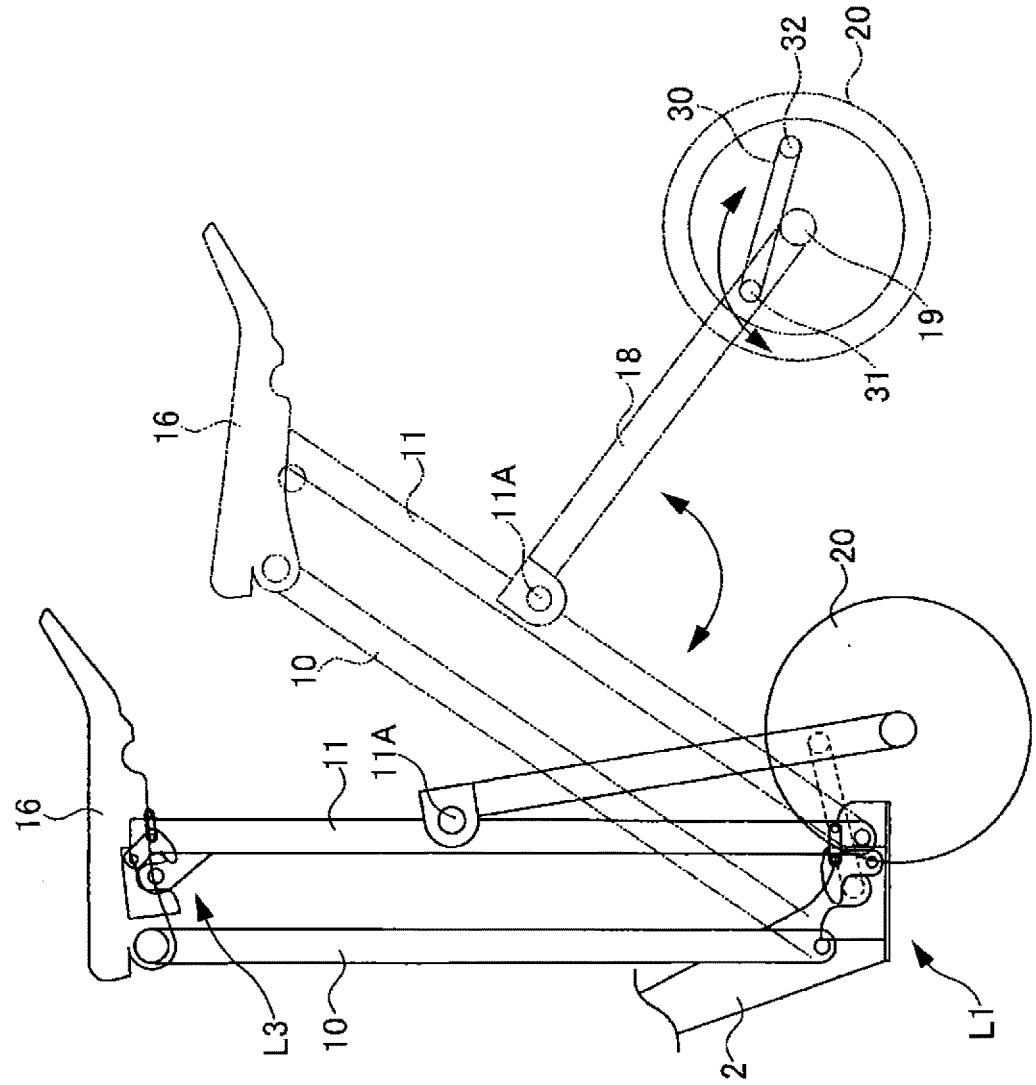
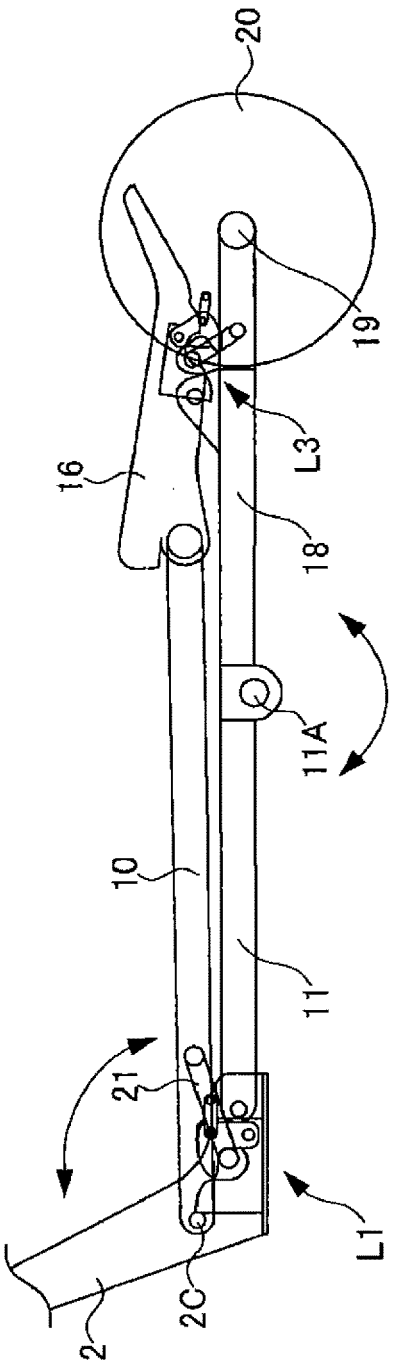


FIG. 11



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 4117660 B **[0002] [0004]**
- EP 2336014 A1 **[0003] [0004]**
- ES 1107807 U **[0003] [0004]**